



## Innovations in Teaching: A Case of Using Kinesthetic Learning Activity for Teaching Physics

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### ABSTRACT

The paper evaluates the advantage of the role of Kinesthetic Learning Activity (KLA) method in understanding basic concepts of physics over traditional methods. This study was conducted during the year 2022-23. The topic “Photo-electric effect” of grade 12 was selected for KLA from feedback of 20 teachers and literature study. A sample of 50 students from two schools in Kolkata was taught the topic traditionally. Later the Kinesthetic learning activities were conducted in the classroom and school field. The data of pre KLA and post KLA were collected and analyzed using various statistical tools using SPSS software. The calculated value of t in paired t-test was 21.289 with p values 0.000 which clearly showed differences in pre and post-KLA and were highly significant. Ninety percent of the respondent students showed high satisfaction with KLA. Major improvement in post-KLA score was observed which increased from an average value of 8.00 to an average value of 15.12. Thus it is concluded that KLA was very effective in teaching the target topic. The learning from this study may be applicable across the disciplines including the field of agriculture extension to make an effective understanding of abstract topics in informal settings also.

### INTRODUCTION

Kinesthetic learning activity (KLA) is an innovative participatory teaching tool in pedagogy which physically engages student in learning. In the schools in India the pedagogy of teaching Physics is more of a lecture method delivery with limited experiments on board Feinstein & Waddington (2020); Sivilotti & Pike (2007). The current study mainly researches one such innovation, using the kinesthetic learning activity (KLA). Kinesthetic learning activity (KLA) is defined as “any activity which physically engages students in the learning process” (Begel et al., 2004). KLAs are sometimes referred to in literature as simulation role play or analogical modeling role play. KLAs can address many of the shortcomings of the traditional classroom by raising the level of engagement during instruction, and can reenergize

a class; these activities engage learning preferences which improves learning outcomes for all students. KLAs can positively affect the culture of interaction in the classroom, encouraging student participation and collaboration (Whitworth et al., 2014). There is evidence to suggest kinesthetic learning may prove especially beneficial to at-risk students (Richards et al., 2017). KLAs draw new ideas in the minds of the students, and serve as useful formative assessment tools for instructors, thus helping in monitoring the learning process. Finally, these activities also induce great deal of excitement and enthusiasm into the classroom and the topics dealt are etched in the memory with clarity and depth (Meng & Rentschler, 2018). There are a number of topics in Physics in the secondary and the senior secondary level which becomes very difficult for the children to conceptualize as they cannot relate to the topic. The framework elaborated by Bloom

and his collaborators consisted of six major cognitive skills: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation (Anderson et al., 2001). It is expected that the Kinesthetic learning activities will help students comprehend the topic better; hence learning outcome for the application, analysis and synthesis can be evaluated with a positive trend.

KLAs has been effectively used in computer science courses (Bonwell, 1996), but very few research on other courses has been conducted. This paper aims to answer the question if there is any remarkable difference in understanding the basic concepts of Physics which cannot be demonstrated or experimented at the school level when applying the contemporary and traditional lecture method with that of the KLA method (Robinett, 2011; Whitworth et al., 2014).

**METHODOLOGY**

Firstly, the gray areas of the topics which were difficult for the children to understand in the secondary and higher secondary level in different schools were identified. For this, 20 High school Physics teachers were asked to identify topics in Grade 12 which were difficult for the children to conceptualize in Physics. Based on their feedback and literature survey (Morrow et al., 2014; Richards & Etkina, 2013; Richards, 2019; Richards, 2020) the topic “Photo- electric effect” was zeroed down. Second step was to teach the topic “Photo- electric effect” to a sample of 50 students from two different schools in the traditional way. Third step was to frame a multiple-choice question based testing process with 18 questions covering all six major cognitive skills based on Blooms taxonomy: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation (Anderson et al., 2001). Fourth step was to administer the pre KLA test on the sample of students and collect the data through a Google form. In the fifth step different kinesthetic learning activities were framed and explained pictorially to the class to introduce the topics “Photo- electric effect” in a play way method. In the sixth step the kinesthetic learning activities were conducted in the classroom and in the school field on the same sample of students.

It was done in multiple small steps. In the first step 10 students performed the activity, while the remaining sample observed. In the second step another group of 10 students

performed the next activity, while the others observed. Thus different groups of the students performed different Kinesthetic learning activity. After the KLA was performed, the students made hypotheses and discussed them and made further conclusions. Then 5 short answer questions were further added to the previous 18 multiple-choice questions based testing process and was administered on the sample of students post kinesthetic learning activity and the data on post KLA was collected. Finally, the data was statistically analyzed in SPSS software using tools like pair t test to study the effectiveness of the KLA.

**RESULTS AND DISCUSSION**

**Degree of satisfaction**

The degree of satisfaction was divided into four categories: low, medium, high and very high. As evident from the pie chart majority of the respondents (90%), showed high satisfaction followed by medium satisfaction (6%), whereas only 4 per cent of the respondents showed low satisfaction from inclusion of kinesthetic learning activity in teaching method of Physics. Among the high degree satisfaction, 62 per cent of respondents showed very high satisfaction, while 28 per cent respondents showed moderately high satisfaction from this method of study. Overall the degree of satisfaction from the respondent was very high after performing the Kinesthetic learning activity to teach Photoelectric effect in School curriculum (Figure 1).

**Effect of KLA on Scoring of the students**

The Figure 2 shows students’ score pre KLA and post KLA based on 18 questions administered, where blue line indicates the

**Table 1.** Paired sample statistics n=(N-1)

		Mean	Std deviation	Std error Mean
Pair 1	Pre marks	8.00	1.708	0.244
	Post marks	15.12	1.481	0.212

**Table 2.** Paired samples Correlation n=(N-1)

		Correlation	Sig
Pair 1	Pre-post marks	-0.074	0.613

**Figure 1.** Degree of satisfaction of Kinesthetic learning activity in teaching Method

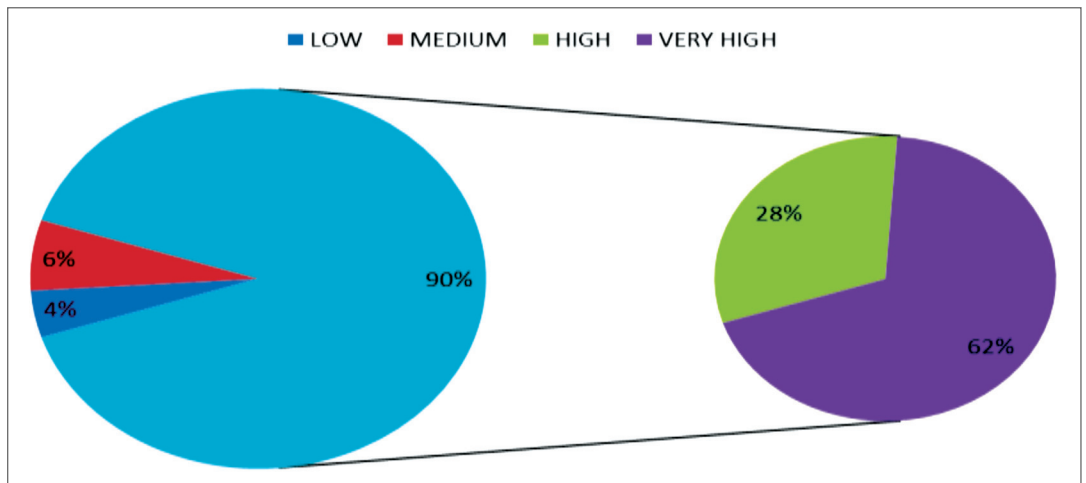




Figure 2. Pre and Post KLA scoring by the students

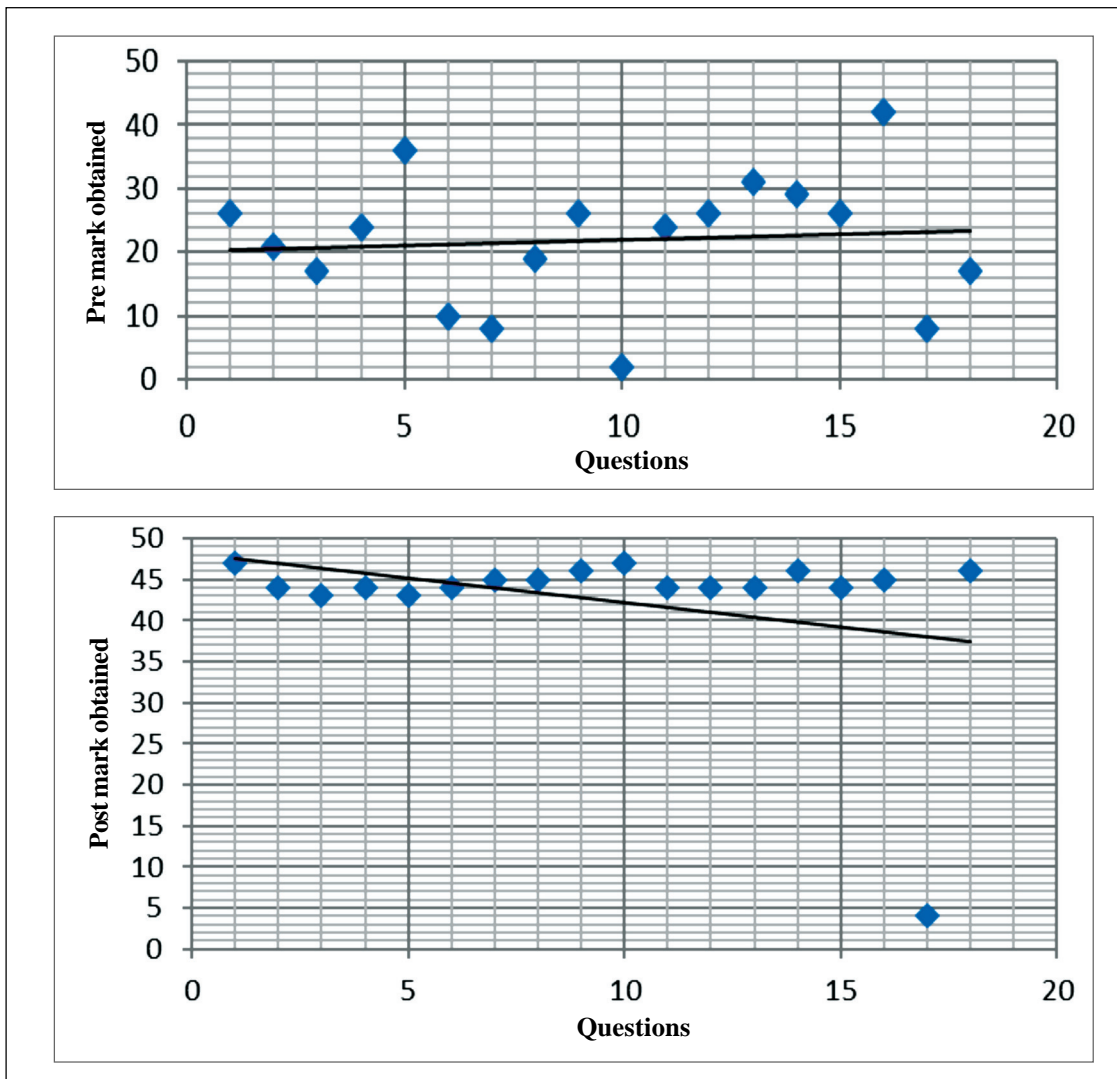


Figure 3. Pre and Post KLA marks obtained by the students

**Table 3.** Paired Samples Correlations n=(N-1)

	Mean	Std. deviation	Std. error mean	Paired differences				
				95% CI of the difference		t test result	degrees of freedom	sig
				Lower	Upper			
Pre-post marks obtained	-7.122	2.342	0.335	-7.797	-6.450	-21.289	48	0.000

pre KLA Score and redline indicates the post KLA Score. The pre KLA score is low whereas post KLA shows sharp rise in the students score. The score being high post Kinesthetic Learning Activity clearly explains that this was an innovative method of teaching learning process leading to higher scores ultimately better learning.

**Effect of KLA on marks of the students**

The Figure 3 shows pre KLA and post KLA marks obtained by the students in Photo Electric Effect with respect to consolidation of marks. It is seen that the pre KLA score obtained by the students is scattered in the lower region, while the post KLA score for all the students was in the higher region. Thus it is evident that *kinesthetic learning activity (KLA)* is very effective in teaching Photo Electric Effect to the Physics student.

The data was analyzed using the Paired t est. First, the data was entered into SPSS software and after that it was analyzed. The null hypothesis (Ho) was that the difference between pre kinesthetic and post kinesthetic is zero. The calculated value of t was tested by using p value at 5% level of significance. The calculated value of t was 21.289 with p value 0.000. It shows that pre and post kinesthetic differences were highly significant. However, pre and post marks obtained by the students were weekly and negatively correlated ( $r=-0.074$ ,  $p>0.05$ ), This interactive nature of KLAs makes it a valuable tool for “content-related” exercises and understanding ambiguous topics in a play way method. The KLA method of teaching can also be used to address social challenges faced by any classroom or society. This innovative method of teaching can be further researched and adapted in the field of agricultural extension for the training of extension personnel, researchers, line department officials and farmers.

**CONCLUSION**

The data collected and analyzed using graphical and statistical method clearly shows the advantage of using kinesthetic learning activity in teaching Physics to the student. The calculated value of t is 21.289 with p value 0.000 shows that differences in pre and post kinesthetic are highly significant. The degree of satisfaction calculated also showed most of the participants were highly satisfied (90%). Further the high (28%) and very high (62%) level of satisfaction states clearly that degree of satisfaction from the respondent is very high. The impact of students score pre KLA and post KLA clearly explains that the score is higher post KLA. It is seen that the pre KLA score obtained by the students is scattered in the lower region, while the post KLA score for all the students is in the higher region. From the above discussions we

can conclude that *kinesthetic learning activity (KLA)* is highly effective in teaching Photo Electric Effect which has been identified as a difficult concept in Physics in School curriculum. This research has shown that the effect of KLA makes a significant contribution to general and conceptual understanding of the concepts of Physics based on the Photoelectric effect. Thus the innovations in teaching Physics in School Curriculum using Kinesthetic Learning Activity should be introduced in the school curriculum.

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